18.06 - Spring 2004 - Problem Set 5

March 15, 2004

This problem set on lectures $15-17$ is due Wednesday (March 17th), at 4 PM, at 2-106. Make sure to include your **name and recitation number** in your homework! The numbers of the sections and exercises refer to " Introduction to Linear Algebra, **3rd Edition**, by Gilbert Strang.".

Lecture 15:

- **Read:** book section 4.3.
- **Work:** book section 4.3 (exercises 4, 9, 12, 26 and 27)

Lecture 16:

- **Read:** book section 4.4.
- **Work:** book section 4.4 (exercises 3, 7, 15, 18, 24 and 36).

Lecture 17:

- **Read:** book section 5.1.
- **Work:** book section 5.1 (exercises 3, 8, 12, 15, 28 and 33).

Challenge Problem with MATLAB This problem fits the best (least squares) straight line to m random observations : use $b = randn(1, m)$. Repeat N times to get average values of C and D in the best line $C + Dt$. (The values of $t_1, \ldots, t_m$ should be just $1 : m$.)

1. For a fixed size m (try $m = 100$), how quickly (what power of N) does the average of C, D over N experiments approach its limit? HINT: You might take logarithms so that average $\approx N^{-p}$ tells you the power p.
2. As you increase m, how does the average behave as function of m? HINT: Again I am looking for the exponent q in average $\approx m^{-q}$.

Please staple your solution as first page of your homework.